

Sub 027

1. A hybrid composite flywheel rim comprising:
at least two different types of fibers impregnated with a thermosetting resin such as epoxy resin and wound in an annulus on a mandrel, said two different fibers having different elastic moduli;
one of said two fiber types being randomly distributed amongst the other fiber macroscopically.

2. A fabrication method for the rim as defined claim 1, wherein:
fiber tows are laid in a lay-up pattern that is defined by controlling the correlation between lead rate per mandrel revolution and winding length.

3. A fabrication method for the rim as defined claim 2 wherein;
fiber tows are laid in a lay-up pattern that is defined by controlling the correlation between lead rate per mandrel revolution and winding length.

4. A fabrication method for the rim as defined claim 1, wherein:
the following equation is satisfied.

$$W_L = (N + B/A) \cdot L_R$$

$$W_L + L_R < L_m$$

where

N : Maximum integer obtained when W_L is divided by L_R

A : integer larger than B

B : integer smaller than A

wherein

$$B/A \setminus 1, 1/2, 1/3, 1/4$$

W_L : Winding Length (inch)

L_R : Lead Rate (inch)

L_m : Distance between inner faces of two mandrel flanges (inch)

$$m \cdot L_R = n \cdot Sp$$

m : integer ≥ 2

n : integer ≥ 2

Sp : fiber space amongst other fiber (inch)

5. A hybrid composite flywheel rim, comprising:
 fibers having different elastic moduli, said fibers including carbon fiber, glass fiber, said
 fibers fixed in a matrix of thermosetting resin such as epoxy resin;
 said carbon fiber is distributed amongst the other fiber in a cross hatch pattern
 macroscopically.

6. A hybrid composite flywheel rim as defined claim 5, wherein:
 the following equation is satisfied:

$$W_L = (N + B/A) \cdot L_R$$

$$W_L + L_R < L_m$$

N : Maximum integer obtained when W_L is divided by L_R

A : integer larger than B

B : integer smaller than A

$$B/A \setminus 1, 1/2, 1/3, 1/4$$

W_L : Winding Length (inch)

L_R : Lead Rate (inch)

L_m : Distance between inner faces of two mandrel flanges (inch)

$$m \cdot L_R = n \cdot Sp$$

m : integer ≥ 2

n : integer ≥ 2

Sp : fiber space amongst other fiber (inch)

7. A composite flywheel rim, comprising:

an annular structure having a plurality of zones, each with multiple fiber layers in a resin
 matrix, each said fiber layer having a mixture of carbon fiber tows and glass fiber tows at a ratio
 of tows that is constant in each layer of any single zone, and said ratio incrementally increases
 zone-by-zone radially toward outside zones of said rim;

wherein said carbon fiber tows lie in a macroscopically uniform distribution in each zone
 by controlling the correlation between lead rate of the fiber band as it is wound onto the mandrel
 per mandrel revolution and the winding length.